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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/723,237	11/26/2003	Chih-Ta Wu	TS01-1630	9171

47390 7590 11/03/2005

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EXAMINER
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TRINH, MICHAEL MANH

ART UNIT	PAPER NUMBER
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2822

DATE MAILED: 11/03/2005

Please find below and/or attached an Office communication concerning this application or proceeding.

## Office Action Summary

Application No.

10/723,237

Applicant(s)

WU ET AL.

Examiner

Michael Trinh

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

### Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

### Status

- 1) ☒ Responsive to communication(s) filed on 22 August 2005.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

### Disposition of Claims

- 4) ☒ Claim(s) 1-9 is/are pending in the application.
- 4a) Of the above claim(s) \_\_\_\_\_ is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 1-9 is/are rejected.
- 7) ☐ Claim(s) \_\_\_\_\_ is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

### Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on \_\_\_\_\_ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

### Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some \* c) ☐ None of:
- ☐ Certified copies of the priority documents have been received.
  - ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
  - ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

\* See the attached detailed Office action for a list of the certified copies not received.

### Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☒ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)  
Paper No(s)/Mail Date 2/25/04.
- 4) ☐ Interview Summary (PTO-413)  
Paper No(s)/Mail Date. \_\_\_\_\_.
- 5) ☐ Notice of Informal Patent Application (PTO-152)
- 6) ☐ Other: \_\_\_\_\_.

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## DETAILED ACTION

\*\*\* This office action is in response to Applicant's election filed on August 22, 2005. Claims 1-30 are pending, in which claims 10-30 are non-elected.

### *Election/Restrictions*

1. Claims 10-30 are withdrawn from further consideration pursuant to 37 CFR 1.142(b) as being drawn to a nonelected invention. Election was implicitly made without traverse in Paper mailed date August 22, 2005.

\*\* Claim 1 is generic claim. Applicant submitted that "...if claim 1 is allowed in its current form, then all claims should be examined". Claims 10-30 were however canceled by Applicant.

Applicant is reminded that, upon the allowance of a generic claim, applicant will be entitled to consideration of claims to additional *species which are written in dependent form or otherwise include all the limitations of an allowed generic claim as provided by 37 CFR 1.141*. If claims are added after the election, applicant must indicate which are readable upon the elected species. MPEP § 809.02(a).

### *Claim Rejections - 35 USC § 102*

2. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(a) the invention was known or used by others in this country, or patented or described in a printed publication in this or a foreign country, before the invention thereof by the applicant for a patent.

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

(e) the invention was described in a patent granted on an application for patent by another filed in the United States before the invention thereof by the applicant for patent, or on an international application by another who has fulfilled the requirements of paragraphs (1), (2), and (4) of section 371(c) of this title before the invention thereof by the applicant for patent.

3. Claims 1-4 are rejected under 35 U.S.C. 102( b) as being anticipated by Chou et al (2002/0168468).

Re claim 1, Chou et al teach (at Figs 4A,5A; paragraphs 56-60; Fig 3; paragraph 44-54) a method for processing a TiN layer on a substrate comprising at least the steps of: providing a

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substrate; depositing a TiN layer with a halogen containing titanium source gas and a nitrogen source gas on the substrate in a first process chamber (paragraphs 49-50,56); and subject the TiN layer to a plasma treatment involving a N-containing gas (paragraphs 56-57,53-54).

Re claim 2, wherein the nitrogen source gas is  $\text{NH}_3$  (paragraphs 48-50). Re claim 3, wherein the halogen containing titanium source gas is  $\text{TiCl}_4$  (paragraphs 49-50). Re claim 4, wherein the deposition is chemical vapor deposition (paragraph 48,44).

### *Claim Rejections - 35 USC § 103*

4. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

This application currently names joint inventors. In considering patentability of the claims under 35 U.S.C. 103(a), the examiner presumes that the subject matter of the various claims was commonly owned at the time any inventions covered therein were made absent any evidence to the contrary. Applicant is advised of the obligation under 37 CFR 1.56 to point out the inventor and invention dates of each claim that was not commonly owned at the time a later invention was made in order for the examiner to consider the applicability of 35 U.S.C. 103(c) and potential 35 U.S.C. 102(f) or (g) prior art under 35 U.S.C. 103(a).

5. Claims 7-9 are rejected under 35 U.S.C. 103(a) as being unpatentable over Chou et al (2002/0168468) taken with Lee et al (6,291,342).

Chou et al teach (at Figs 4A,5A; paragraphs 56-60; Fig 3; paragraph 44-54) a method for processing a TiN layer on a substrate as applied to claims 1-4 above. Re claim 6, wherein the plasma treatment comprises a N-containing gas flow rate of about 100-1000 sccm, a chamber temperature of about 400-1000°C, a chamber pressure of about 5-30 Torr, a RF power of about 0.5 W/cm<sup>2</sup> to 10W/cm<sup>2</sup> (paragraphs 53-54) Re further claim 7, wherein the N-containing gas is one of  $\text{N}_2$ ,  $\text{NH}_3$ , or  $\text{N}_2\text{H}_4$  (paragraphs 53 and 54). Re further claim 8, wherein adding  $\text{H}_2$  to  $\text{N}_2$  during plasma treatment (paragraphs 53-54). Re claim 9, wherein a metal layer is deposited on the TiN layer after the plasma treatment (Fig 7D; paragraph 70).

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Re claim 9, Chou already teaches depositing a metal layer on the TiN layer, but lacks planarizing the metal layer.

However, Lee teaches (at Figs 6D-6E; col 9, line 64 through col 10, line 6) depositing a metal layer 140 on the TiN layer, and planarizing the metal layer (Fig 6E) by polishing.

Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to form the metallization level of Chou by planarizing the metal layer as taught by Lee. This is because of the desirability to form a planar metal structure having a metal plug within the contact hole.

Re further claim 6, the subject matter as a whole would have been obvious to one of ordinary skill in the art at the time the invention was made to select the portion of prior art's range of pressure, temperature, power, flow rate, such as taught by Chou, which is within the range of applicant's claims, because it has been held to be obvious to select a value in a known range by optimization for the best results, and would be an unpatentable modification, where the general conditions of a claim are disclosed in the prior art, it is not inventive to discover the optimum or workable ranges by routine experimentation". *In Re Aller* 104 USPQ 233,255 (CCPA 1955); *In re Waite* 77 USPQ 586 (CCPA 1948).

6. Claim 5 is rejected under 35 U.S.C. 103(a) as being unpatentable over Chou et al (2002/0168468) taken with Iyer et al (5,733,816) and Nguyen (6,756,318).

Chou et al teach (at Figs 4A,5A; paragraphs 56-60; Fig 3; paragraph 44-54) a method for processing a TiN layer on a substrate as applied to claims 1-4 above.

Re claim 5, Chou already teaches performing a plasma treatment, but lacks performing ex-situ in a second process chamber.

However, Iyer teaches (at col 4, lines 18-26) plasma treating of a deposited metal layer by performing either in-situ in a same chamber or ex-situ in a second processing chamber. Nguyen teaches (at col 3, line 63 to col 4, line 13; Fig. 9; col 14, line 15 through col 15; Fig 14) depositing a first chamber, and plasma treating of a deposited metal layer by performing ex-situ in a second chamber.

Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to form the metallization level layer of Chou by plasma treating of a

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deposited metal layer by performing either in-situ in a same chamber or ex-situ in a second processing chamber, as taught by Iyer and Nguyen. This is because these processes are alternative and art recognized equivalent for substitution in order to perform a plasma treatment of the deposited metal layer, wherein using various multi-chambers would improve productivity since each chamber can be used for a specific process.

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Any inquiry concerning this communication or earlier communications from the examiner should be directed to Michael M. Trinh whose telephone number is (571) 272-1847. The examiner can normally be reached on M-F: 8:30 Am to 5:00 Pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Amir Zarabian can be reached on (571) 272-1852. The fax phone number is (571) 273-8300.

Any inquiry of a general nature or relating to the status of this application should be directed to the receptionist whose telephone number is (703) 308-0956.

Oacs-18



Michael Trinh  
Primary Examiner